

University of Bahrain
College of Information Technology
Department of Computer Science
ITCS252 Discrete Mathematics
Second Semester 2013/2014
Quiz #1

10/10

ID: [redacted] Name: [redacted] Section: [redacted]

Q1: Let p, q , and r be the proposition

- p : You have a quiz.
 q : You play football.
 r : You get A.

Express each of the following into symbolic form.

- a) Neither you do not have a quiz nor play football.

$\neg(\neg p \vee q)$ ✓

- b) Playing football is necessary for not getting A.

$\neg r \rightarrow q$ ✓

Q2: Let p stands for "I am a CS student", and let q stands for "I take ITCS252". Express the conditional statement $p \rightarrow q$ in English:

- (a) Using necessary.

taking ITCS252 is necessary for CS student ✓

- (b) Using implies.

I am a CS student implies I take ITCS252 ✓

Q3: Write the truth table of $\neg p \vee (p \vee q)$

p	q	$\neg p$	$p \vee q$	$\neg p \vee (p \vee q)$
T	T	F	T	T
T	F	F	T	T
F	T	T	T	T
F	F	T	F	T



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Quiz #2

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Q1. Let $D = \{-1, 0, 1, 2\}$. For each statement, what is the truth value. Give reasons.

(a) $\forall x \in D : (x \leq 0) \wedge (x \geq 2)$

False.

counterexample $x = -1$; $-1 \leq 0$ but $-1 \not\geq 2$

(b) $\exists x \in D : x^2 < x$

False.

for All D , there is no number such $x^2 < x$

($-1 \not< 1$, $0 \not< 0$, $1 \not< 1$, $2 \not< 4$)

Q2. Let $b(x)$: " x is a boy", $g(x)$: " x is a girl", and $t(x)$: " x plays tennis".

Express the following statements in symbolic form using only the predicates $b(x)$, $g(x)$, and $t(x)$.
The domain is P , the set of all people.

(a) Every girl plays tennis.

$\forall x \in P : g(x) \rightarrow t(x)$

(b) All boys and girls do not play tennis.

$\forall x \in P : (b(x) \vee g(x)) \rightarrow \neg t(x)$

(c) Some boys do not play tennis.

$\exists x \in P : b(x) \wedge \neg t(x)$

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Quiz #4

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ID: [REDACTED] Name: [REDACTED] Section: [REDACTED]

Q1. Use truth tables to show whether the following argument is valid or not.

$$\begin{array}{l} p \rightarrow q \\ \neg r \vee \neg q \\ \hline r \\ \hline \therefore \neg p \end{array}$$

$$(p \rightarrow q) \wedge (\neg r \vee \neg q) \wedge r \equiv \neg p$$

①		②			③		④		
P	q	r	$p \rightarrow q$	$\neg r$	$\neg q$	$\neg r \vee \neg q$	$p \rightarrow q$	$\neg r \vee \neg q$	$(p \rightarrow q) \wedge (\neg r \vee \neg q)$
T	T	T	F	F	F	F	T	F	F
T	T	F	F	F	T	T	T	T	F
T	F	T	F	T	F	F	F	T	F
T	F	F	F	T	T	T	F	T	F
F	T	T	T	F	F	F	T	F	F
F	T	F	T	F	T	T	T	T	F
F	F	T	T	T	F	T	T	T	T
F	F	F	T	T	T	T	T	T	F

\therefore Not valid

critical rows?

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Quiz #4

10/10

ID: [REDACTED]

Name: [REDACTED]

Section: [REDACTED]

Q1. Use *Proof by Contradiction* to prove that if n is divisible by 3, then $n^2 + 3n$ is divisible by 9.

Hypothesis: n is divisible by 3

Conclusion: $n^2 + 3n$ is divisible by 9

Proof by Contradiction:

Suppose not - Suppose there exist a number n such that
it's divisible by 3 and $n^2 + 3n$ is not divisible by 9.
By definition $n = 3k, k \in \mathbb{Z}$. ✓

$$\therefore n^2 + 3n = (3k)^2 + 3(3k) = 9k^2 + 9k$$

$$= 9(k^2 + k)$$

$$= 9w \quad \text{(contradiction)}$$

$$w \in \mathbb{Z}$$

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Quiz #5



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(1) List the elements in each of the following sets:

(a) $\{x \in \mathbb{Z}^+ \mid x + y = 3 \text{ for some } y \in \mathbb{Z}\} = \{1, 2, 3, 4, 5, 6, \dots\}$

(b) $\{x \in \mathbb{R} \mid x^2 = -5\} = \{\}$

(2) For $A = \{a, \{b\}, c, \{a, b\}\}$, find

(a) $A - \{a, b\} = \{c, \{a, b\}\}$

(b) $\{\emptyset\} - A = \{\}$

(c) $\{a, b, c\} - A = \{b\}$

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Quiz #6

9.5 + 0.5
10

ID: [REDACTED] Name: [REDACTED] Section: [REDACTED]

Q1. For an integer $n \geq 1$ use mathematical induction to prove that

$$2 + 4 + 6 + \dots + 2n = n^2 + n$$

1) Basis step:

$$RHS = (1)^2 + 1 = 2 \quad \text{true}$$

LHS?

2) Assumption: $n = k$

$$2 + 4 + 6 + \dots + 2k = k^2 + k \quad \checkmark$$

3) Induction: $n = k+1$

$$2 + 4 + 6 + \dots + (2k+2) = (k+1)^2 + (k+1) \quad \checkmark$$

$$LHS = 2 + 4 + 6 + \dots + 2k + (2k+2)$$

$$= k^2 + k + 2k + 2$$

$$= k^2 + k + 2k + 2 + 1 - 1$$

$$= k^2 + 2k + 1 + k + 1$$

$$= (k+1)^2 + (k+1) = RHS \quad \checkmark$$